

## ADAPTIVE OPTICS SEE BRIGHT FUTURE IN SHIPPING, MOVIE PRODUCTION

*Real-time data processing techniques for adaptive optics greatly enhance computer-generated animation and industrial motion and control.*



■ An Adaptive Optics Associates package-scanning system (pictured in the background) keeps parcels moving at Federal Express.

How do you create the illusion of milling crowds on the deck of an ill-fated passenger ship? Digital Domain faced that question when putting together some animation clips for the recent blockbuster film *Titanic*. Props were used much of the time for wide-angle ship views, but other images were needed to make these shots more realistic and believable to the audience.

Using motion capture technology developed in conjunction with Adaptive Optics Associates, Inc. (AOA; Cambridge, MA), Digital Domain's animators successfully generated this populated illusion for the movie. AOA's computer animation and visualization software lends realism to motion capture data used in computer-assisted animation. For example, AOA's products have been used by animators to make commercials for Reebok. In addition, AOA's FaceTrax™ facial expression capture system has been used by a production company to create virtual reality settings for a CBS weekly children's program, and by British Broadcasting Corporation to develop the world's first real-time animated cartoon character appearing "live" on a television program.

AOA's motion capture systems use reflective sensors that are pasted onto critical moving parts of a body or the most mobile features of the face. Cameras, operating at up to 240 frames per second, record the patterns of motion from the reflective dots. This process allows computer animators to create "control points" based on the captured movements; these points are used to guide the frame-by-frame rendering of nearly lifelike 2-D or 3-D models. Using commercially available rendering software, the animator can then overlay the figure with more sophisticated imagery. AOA's systems use real-time data processing techniques that were originally developed for adaptive optics research for BMDO's predecessor, the Strategic Defense Initiative Organization.

**Capturing motion data.** Motion capture technology could eventually become an important part of AOA's business. "The ability to collect real-world movement and facial expression in real time using digital camera and tracking technology is not only advantageous for animation, but also for industrial motion and control applications," says Anderson Maddocks, marketing director for AOA. "What AOA has learned developing ways to capture motion data for special effects has helped to improve the robustness of its technologies and enabled new applications."

In addition to assisting with computer-generated animation, AOA has found less entertaining but equally important applications for its imaging technology in expediting freight transport. AOA has developed a package scanning and dimensioning system for Federal Express Corporation (FedEx). More than 50 units have been installed throughout FedEx's major hub-and-spoke locations, helping the company move large parcels more effectively.

Overnight packages are not always nice, neat, blue-and-orange boxes. They can be lumpy, tape-wrapped parcels, round tins of cookies, or car mufflers, all with bar-coded labels slapped on them. Mounted above the package-moving conveyor belt, AOA's dimensional imaging system uses laser radar technology and bar-code scanners to take the guesswork out of pricing odd shapes and sizes of packages.

**Scans odd-shaped parcels.** The system locates and reads bar codes on the fly, scanning up to 15,000 parcels per hour on conveyor belts that move at 300 feet per minute. A unique feature of this system is its ability to accurately measure parcels that are large, irregularly shaped, touching each other, and strewn in an irregular fashion on the conveyor belt. The scanners measure with 99.7 percent accuracy parcels as large as 3 x 5 x 8 feet, to within a half-inch of their length and width and a quarter-inch of their height.

After obtaining information about the packages, the system makes the data available for a variety of uses within FedEx's information systems. This information helps the company plan and manage the package-processing operation and assess the number of places and trucks it will need at various locations. "We're providing them with statistics they never had before," says Maddocks. FedEx is using the system not only in its largest on-airport sorting facilities—called hubs—but also at smaller facilities that form the "spokes" of its hub-and-spoke transportation network.

While popularizing its technology, AOA still serves the sophisticated optical needs of the astronomical community. Some of its optical products are part of the adaptive optics systems on the Keck I and II telescopes on Mauna Kea, Hawaii. AOA also supplied some wavefront sensors for laser guide star testing at the Lick Observatory on Mount Hamilton near San Jose, California. Recently, it installed a complete adaptive optics system for the Max Planck Institute for Astronomy on a 3.5-meter telescope in Calar Alto, Spain.

■ For more information, contact Cameron Dryden via telephone at (617) 864-0201 or via E-mail at [cameron@aoainc.com](mailto:cameron@aoainc.com). You can also visit AOA's Web site at <http://www.aoainc.com>.



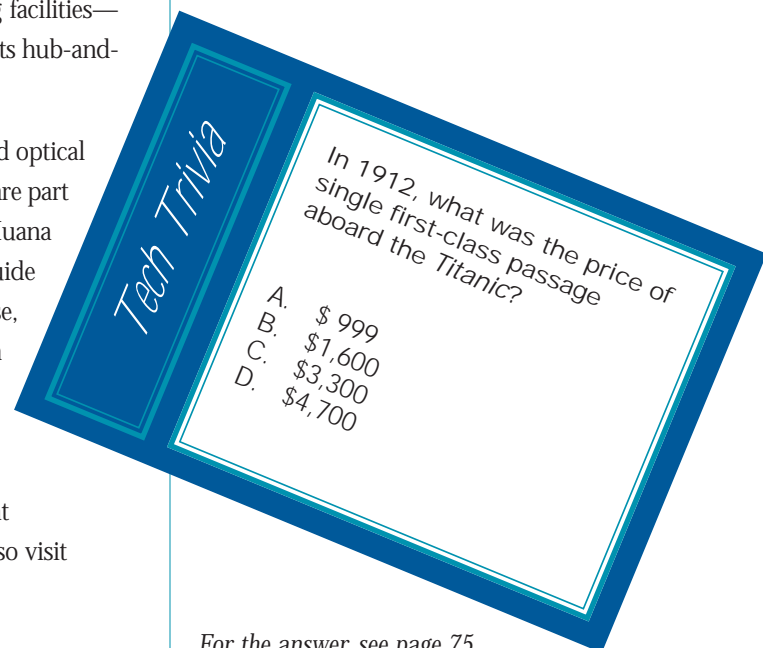
#### What Does It Mean to You?

Real-time data processing in special effects systems means that animators can make computer-generated characters and scenery more lifelike, bringing more realism to the silver screen.



#### What Does It Mean to Our Nation?

Real-time data processing in mass scanning systems helps reduce operational costs for industry by improving the effectiveness of production lines and for shipping companies by expediting the delivery of freight.



*For the answer, see page 75.*